

## **SECTION 558 TIMBER STRUCTURES**

**558.01 DESCRIPTION.** This work is furnishing materials for, and constructing timber structures and the timber portions of composite structures.

**558.02 MATERIALS.** Furnish materials meeting the following Subsections requirements:

Treated and Untreated Timber Piles .....	706.05
Structural Timber and Lumber .....	706.01
Treated Timber .....	706.04
Bolts and Nuts .....	711.07
Galvanized Metal .....	711.08
Structural Steel .....	711.02
Crushed Top Surfacing .....	701.02

Drift-pins and dowels may be wrought iron or medium steel.

Furnish washers made of iron castings or malleable castings, unless otherwise specified.

Furnish galvanized or cadmium plated hardware, except cast iron washers, meeting ASTM A 165, Type OS.

### **558.03 CONSTRUCTION REQUIREMENTS.**

**558.03.1 Construction Drawings.** Furnish shop drawings that detail the material grade, cutting, framing, boring details, dimensions, size of material, and all other information necessary for fabrication and erection of the timber.

Furnish all shop drawings on 22 X 36-inch paper (A1 paper) with a 1½-inch (46 mm) margin on the left side and a ½-inch (43 mm) margin on the other 3 sides.

Check and approve fabrication drawings before submitting 4 copies to the Project Manager. The Contractor approval must be shown on the drawings. Do not begin cutting and framing until the drawings are returned by the Project Manager.

**558.03.2 Handling of Materials.** Handle timber without dropping, breaking outer fibers, bruising, or penetrating the timber surface. Use rope slings to handle treated timber.

**558.03.3 Storage of Materials.** Store timber in neat stacks on ground free of weeds and rubbish.

Open-stack untreated timber at least 12-inches (300 mm) above the ground. Cover timbers as required to protect them from weather. Close-stack treated timbers to prevent warping.

**558.03.4 Treatment of Breaks and New Cuts.** Trim and treat all cuts and abrasions in treated timbers with 3 applications of a solution of copper naphthenate containing a minimum of 2% copper metal or with chromated copper arsenate (CCA) meeting AWWA M4. Follow treatment with one coat of hot tar.

**558.03.5 Temporary Attachment.** Attach forms or temporary braces to treated timber with nails or spikes. Once the nails or spikes are removed, fill the holes by driving galvanized nails or spikes flush with the surface or plugging with creosote plugs after treating the holes with creosote oil.

**558.03.6 Bearing.** Level post and pile caps to provide full, even bearing on all posts or piles in the bent. Secure caps to each pile or post using a 3/4-inch (19 mm) diameter drift-pin extending at least 9-inches (230 mm) into the pile or post center.

**558.03.7 Sills and Mud Sills.** Evenly bed mud sills to solid bearing and tamp in place. Assure sills have true and even bearing on concrete sills, piles, or pedestals. Drift-bolt sills to mud sills or piles with 3/4-inch (19 mm) diameter bolts or larger extending into the concrete sills or piles at least 6-inches (155 mm). Remove all soil in contact with sills to provide free air circulation.

**558.03.8 Framing.** Cut timber for framing before treating with preservatives.

Cut and frame truss and bent timbers to a close fit providing even bearing over the entire joint contact surface. Blocking, shimming or open joints are not allowed.

Construct mortises true to size for the full depth. Fit tenons snugly in mortises.

Accurately frame cross bridging between stringers at the center of span and securely toe-nail with at least 2 nails in each end. Assure all cross bridging members have full bearing at each end against the sides of stringers.

**558.03.9 Bolt Holes.** Size holes for drift-pins, dowels, and bolts the same diameter of the pin or dowel to be used. Do not make holes for lag screws larger than the body of the screw at the base of the thread. Make holes for rods 1/16-inch (2 mm) larger in diameter than the rod.

Treat all bore holes in treated timber, made after treatment, with an approved pressure bolt hole treater. Seal holes for rods with hot tar or other approved waterproofing once the rods are inserted.

Countersink where smooth faces are specified. Treat horizontal recesses formed for countersinking with 3 applications of copper naphthenate containing a minimum of 2 percent copper metal or with chromated copper arsenate (CCA) meeting AWPA M4. Fill the countersink with hot tar once the bolt or screw is in place.

**558.03.10 Stringer Sizing.** Size stringers between bearing points only. Make butt joints for outside stringers. Frame interior stringers to bear over the full width of floor beam or cap at each end. Securely anchor the stringer ends to the cap. Separate untreated timbers at least 1/2-inch (13 mm) for air circulation.

**558.03.11 Roadway Floors.** Make roadway floors strip or laminated as specified, surfaced S1S1E or S4S.

**A. Laminated Floors.** Place the strips on edge and draw down tightly against the stringer or nailing strip and the adjacent strip and spike them. Extend each strip the full deck width unless otherwise specified.

Spike each strip to the adjacent strip at intervals not exceeding 2 feet (610 mm), staggering the spikes 8-inches (205 mm) in adjacent strips. Use spikes long enough to pass through 2½ strips. Toe-nail each strip to alternate stringers with 40d (125 mm X 5.7 mm) common nails with adjacent strips nailed to every alternate stringer unless bolting is specified. Toe-nail the ends of all strips to the outside stringer. Cut off the strip ends on a true line parallel to the centerline of the roadway. When bolts are used to fasten laminated floors to stringers, space the bolts as specified and draw them down tightly on the bolting strips. Draw the bolt heads down flush with the deck surface. Use double nuts or single nuts with lock washers on all bolts. Spike the strips as specified above.

- B. Plank Floors.** Make plank floors out of a single thickness of plank on stringers or joists. Unless otherwise specified, lay the planks heart side down. Spike planks to each joist or nailing strip with at least 2 spikes 4-inches (100 mm) longer than the plank thickness. Spike the planks at least 2½-inches (64 mm) from the edges with the edges cut off on a straight line parallel to the roadway centerline. Adjacent planks must not vary in thickness by more than 1/16-inch (2 mm). Planks are S1S1E unless otherwise specified.

**558.03.12 Deck Surface Treatment.** Treat the entire top surface of the deck and the inside surfaces of curbs with hot tar meeting ASTM D 490, Grade RT-7 or RT-8 (RT-7 is adapted to cold-weather application, RT-8 to warm-weather application).

Heat the tar in an open tank or kettle to between 200 °F to 225 °F (93 °C to 107 °C). Apply 3 even coats to the surfaces to be treated, each at 1/4 gallon per square yard (1.1 L per m²). Allow each coat sufficient time to cool and set up before applying the next coat.

After the final coat of tar has cooled and set up, cover the entire deck surface with aggregate surfacing at 1 cubic yard per 24 square yards (1 m³ per 25 m²) of surface area before opening to traffic. Furnish aggregate surfacing meeting the requirements of crushed top surfacing Type A, Grade 2 or 3, or Type B, Grade 3, except that the material passing the 200-mesh (0.075 mm) sieve cannot exceed 10% .

**558.03.13 Wheel Guards.** Bolt wheel guards to the outside stringers using 3/4-inch (19 mm) machine or hook bolts spaced a maximum 5 feet (1525 mm) center-to-center. Lap all joints. A bolts must pass through each lapped joint.

Provide drain holes as specified. Line the drain holes with galvanized iron lining, positioned to discharge free of the structure.

**558.03.14 VACANT.**

**558.03.15 Nailing.** Drill holes for nails that are driven near timber ends. Drill the hole only in the piece to be attached. Drill the hole smaller than the nail to provide a tight fit.

**558.03.16 Washers.** Use washers behind all bolt heads and nuts. Place washers for carriage bolts and large-head timber bolts under the nuts only.

Use cast-washers of the thickness equal to the bolt diameter and a diameter 4 times the thickness. Use malleable and plate washers with a thickness equal to one-half the diameter of the bolt, and the length of each side equal to 4 times the bolt diameter.

Use cast iron washers when timber is in contact with earth.

**558.03.17 Treating and Painting Untreated Timbers.** Treat the following surfaces with 3 applications of copper naphthenate containing a minimum of 2% copper metal or with chromated copper arsenate (CCA) meeting AWPA M4:

1. Ends, tops, and all post contact surfaces, sills, caps, floor beams, and stringers;
2. Ends, joints, and contact surfaces of bracing and truss members;
3. Timber bumper surfaces;
4. The back face of bulkheads;
5. All other untreated timber that is in contact with earth.

**558.04 METHOD OF MEASUREMENT.** Treated and untreated timber and lumber is measured by the thousand feet board measure (cubic meter) based on nominal actual thicknesses and widths. Measurements are computed using the plan dimensions unless changes in plan dimensions are approved by the Engineer. The actual lengths (volume) of the individual pieces in the finished structure will be measured, without deductions for daps, cuts, or splices.

The measurement of laminated timber decking is based on the number of pieces of the size or sizes specified, after dressing, and the actual lengths used in the structure.

Measurements consist of only timber that is a part of the completed and accepted work and does not include timber used for erection, such as falsework, forms, bracing, and sheeting.

**558.05 BASIS OF PAYMENT.** Payment for the completed and accepted work is made under the following:

<u>Pay Item</u>	<u>Pay Unit</u>
Treated and Un-treated Timber	Thousand Board Foot (cubic meter)

Payment at the contract unit price is full compensation for all resources necessary to complete the item of work under the Contract.